The machine may be termed a combination of the Spanish arastra and Wheeler's pan, on a large scale; and Messrs. Climo and Bawden, the patentees, claim that they will produce perfect amalgamation by bringing the pulp in contact with the mercury on leaving the grinding-surfaces, and a constant circuit of the pulp from the outer to the inner side of the trough. They also contend the centrifugal motion tends always to keep the heavier particles to the outer side of the trough; so that, with the addition of clean water mixed with the pulp, nothing but the light and worthless material will pass through the openings in the cone.

To examine this machine closely it will be seen that it has great grinding-power, but it is only suitable for tailings or coarse crushed material. It will, however, reduce the sand to the finest slime; but I fear that the patentees' expectations regarding the amalgamating qualities will not be realized. It is intended to save both silver and gold, but any process of crushing the ore containing sulphide of silver will necessarily carry away a large proportion of silver along with the water. However, it is a very ingenious machine, and the patentees deserve credit for turning their attention towards devising a different mode of treatment from that which is now adopted, as by the present process the loss of silver and gold is very great, and any machine that will give a higher percentage of these metals is a step in the right direction. Annexed is a plan of this machine and sectional elevation, which will enable a better idea to be obtained of its capabilities than can be formed by a mere written description.

Frue's Concentrator.

There is a company which has taken up some of the Foreshore at the Thames, and is concentrating the tailings with one of Frue's concentrators, which is giving very satisfactory results. This machine has been described in my report on the Australian goldfields; but, seeing that it is now in use in the colony and working satisfactorily, a further description may not be out of place.

The frame of the machine is 12ft. long, and in that length it has a slope or fall of 16in. towards the end where the sand is carried away. It has two principal rollers at each end, which carry the endless belt where the material is concentrated. These rollers are made of galvanized iron riveted together, 13in. in diameter and 51in. in length. A larger roller, 24in. in diameter, is placed midway a few inches below the line of the lower periphery of the two end rollers, so that the belt "bands" on the top of the end and beneath the intermediate roller. A fourth roller is provided, made of hardwood, which is geared to a movable plummer-block by a screw. This screw is also used to take up the slack on the belt caused by the weight of the material and water, thus preventing the bagging of the belt. This belt is 4ft. wide by 27ft. 6in. long, and it travels on a number of intermediate rollers so as to keep an even and uniform surface. The belt is made of vulcanized india-rubber and A1 three-ply navy canvas, and it has a rim on each side which stands up 1½in. above the surface where the concentrates are collected.

At the upper end of the belt there is a hopper fixed, into which the sand or tailings to be concentrated are placed, and at the upper side of this hopper there is a water-box placed across the belt and a short distance above it. This box has a number of small holes, which form fine jets which play on the sand in the hopper and also on the belt, which wash the sand regularly down towards the lower end. The belt has two actions, one travelling slowly lengthwise against the stream, and the other a short, quick, lateral motion of about 190 to the minute. This gives a wavy motion to the belt, and keeps the whole of the material alive, the particles of greatest density getting undermost, while the water washes off the light sand. The material being deposited on the travelling-belt, with water flowing downwards towards the lower end, also takes part in the up-hill travel and the lateral shaking motion, which keeps the material in an agitating condition: every particle is more or less suspended in water and follows the oscillation of the shaking-table. The heavier particles settle, and, clinging to the smooth surface of the belt, arrive under the water-spreader, while the light sand is carried down to the foot of the table, where it is dropped into a waste-launder.

The separation of the metallic minerals from the larger grains of sand, which have about the same absolute weight, and which were too heavy to be washed off with the fine sand, is now effected under jets of water which flow from the water-spreader: the force of the descending water takes hold of these grains of sand and carries them now also down to the foot of the table, while the revolving belt carries the heavy metallic minerals which adhere to the surface of the belt over the head of the machine, and deposits them in the concentrating-box, which is partly filled with water, through which the belt passes and consequently washes off all the concentrates.

It is an interesting and instructive experiment in working a Frue concentrator to turn off the water from the water-spreader for a few minutes. The separation of the ore and sand ceases at once, and a mixed layer of all the materials is carried over the head of the machine; but if the water is turned on again, concentration takes place immediately. The shaking-table motion of the belt, which also revolves round the rollers, brings continuously forward new portions of settled ore to be acted on by jets of water, and bright-yellow bands of clear sulphurets are produced, while the unproductive sand is carried away.

Quantity of Water in Concentrating.—It must be evident to any one using these concentrators that the quantity of water used on the belt must vary with the fineness and density of the material to be operated upon. Too much water will wash off particles of the metallic minerals, and too little would produce unclean concentrates; but this is not difficult to regulate. Diminish the uphill travel of the belt if too much sand comes over the head, and increase the speed if sulphurets are getting elongated under the water-box and the ore-spreader.

Vulcan Smelting-works, Onehunga.

This is a furnace made after a design of furnaces used in England for smelting ores, but it is quite new to the colonies. It is constructed on the principle of a reverberatory furnace; but, instead of having flat hearths or being on one incline, it is constructed with two hearths, each 4ft. 6in. long